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ATTN.: *Commisioner for Patents*

FROM: *Nazir Khan, M.D.*

RE: *APPEAL BRIEF for APP. No.:10/812,380*

FAX #: *571-273-8300*

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Comments:

This Appeals Brief as required by 37CFR 41.37 is in response to the Final Office dated May 5 2008.

Application No.: 10/812,380

Filing Date: March 29, 2004

Real Party of Interest:

1. Iftikhar Khan
2. Nazir Khan

Group Art Unit: 3761

Examiner : Leslie Deak

Title: HYBRID ARTERIOVENOUS SHUNT

Attorney Docket: 1800-000001

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I. Related Appeals and Interferences.

There are no appeals or interferences

II. STATUS OF CLAIMS

These are the claims that are involved in the appeal

1. (amended, appealed) An arteriovenous shunt comprising:

a. an arterial graft comprising a body, a lead end and a terminal end, said lead end

being configured for subcutaneous connection to an artery by anastomosis, wherein said

arterial graft has a first diameter; and

b. a single lumen venous outflow catheter comprising an intake end and depositing end,

said depositing end being configured for insertion through a vein into the right atrium of

the heart, wherein said venous outflow catheter has a second diameter different from said first diameter; and

c. a cylindrical cuff operable to direct passage of blood from said arterial graft to said venous outflow catheter, said cuff comprising an inlet in blood communication with an outlet:

i. said inlet being disposed about and connected to said terminal end of said arterial graft; and

ii. said outlet being disposed about and connected to said intake end of said venous outflow catheter; wherein said cuff provides a secure fit for said arterial graft first diameter and said venous outflow catheter second diameter.

2. (previously presented, appealed) The arteriovenous shunt of claim 1 wherein said arterial graft

is made of a biocompatible flexible material.

3. (amended, appealed) The arteriovenous shunt of claim 2, wherein said biocompatible flexible material is polytetrafluoroethylene(PTFE) or other biocompatible material

4. (appealed) The arteriovenous shunt of claim 1, wherein said arterial graft has a diameter from about 2 mm to about 8 mm and a length from about 20 cm to about 60 cm.

5. (appealed) The arteriovenous shunt of claim 4, wherein said arterial graft has a diameter of from about 6 mm to about 8 mm and a length of about 40 cm.

6. (appealed) The arteriovenous shunt of claim 1, wherein said artery is the brachial, axillary, femoral or external iliac artery.

7. (Appealed) The arteriovenous shunt of claim 1, wherein said cuff is polytetrafluoroethylene or polyethylene terephthalate.

8. (Appealed) The arteriovenous shunt of claim 1, wherein said venous outflow catheter has a diameter from about 1 mm to about 7 mm and a length of from about 20 cm to about 80 cm.

9. (Appealed) The arteriovenous shunt of claim 1, wherein said venous outflow catheter has a diameter from about 5 mm to about 7 mm and a length of from about 40 cm to about 60 cm.

10. (amended, appealed) The arteriovenous shunt of claim 1, wherein said venous outflow catheter is made of other biocompatible materials.

11. (appealed) The arteriovenous shunt of claim 1, wherein said vein is the cephalic, axillary, jugular, femoral or external iliac vein.

12. (previously presented, appealed) The arteriovenous shunt of claim 1, wherein said venous outflow catheter has a diameter of about 1 mm smaller than said arterial graft.

13. (amended, appealed) A system for performing hemodialysis on a patient comprising: a. an arteriovenous shunt comprising:

i. an arterial graft comprising a body, a lead end and a terminal end, said lead end being configured for subcutaneous connection to an artery by anastomosis, wherein said arterial graft has a first diameter; and

ii. a single lumen venous outflow catheter comprising an intake end and depositing end, said depositing end being configured for insertion through a vein into the right atrium of the heart, wherein said venous outflow catheter has a second diameter different from said first diameter; and

iii. a cylindrical cuff operable to direct passage of blood from said arterial graft to said venous outflow catheter, said cuff comprising an inlet with blood communication with an outlet:

1. said inlet being disposed about and connected to said terminal end of

said subcutaneous graft; and

2. said outlet being disposed about and connected to said intake end of

said venous outflow catheter; wherein said cuff provides a secure fit for said arterial graft first diameter and said venous outflow catheter second diameter;

14. (previously presented, appealed) The system according to claim 13, wherein said venous outflow catheter has a diameter of about 1 mm smaller than said arterial graft.

15. (original, appealed) The system according to claim 13, wherein said artery is the brachial,

axillary, femoral or external iliac artery.

16. (original, appealed) The system according to claim 13, wherein said vein is the cephalic,

axillary, jugular, femoral or external iliac vein.

17. (amended, appealed) A method of performing hemodialysis on a patient comprising:

a. surgically inserting an arteriovenous shunt into a patient, wherein said arteriovenous shunt comprises:

i. an arterial graft comprising a body, a lead end and a terminal end, said lead end being configured for subcutaneous connection to an artery by anastomosis, wherein said arterial graft has a first diameter; and

ii. a single lumen venous outflow catheter comprising an intake end and depositing end, said depositing end being configured for insertion through a vein into the right atrium of the heart, wherein said venous outflow catheter has a second diameter different from said first diameter; and

iii. a cylindrical cuff operable to direct passage of blood from said arterial graft to said venous outflow catheter, said cuff comprising an inlet in blood

communication with an outlet:

1. said inlet being disposed about and connected to said terminal end of

said arterial graft; and

2. said outlet being disposed about and connected to said intake end of

said venous outflow catheter, wherein said cuff provides a secure fit for said arterial graft first

diameter and said venous outflow catheter second diameter;

b. connecting said arterial graft to a hemodialysis apparatus;

c. collecting blood from the patient through said arterial graft;

d. passing said blood through the hemodialysis apparatus;

e. collecting purified blood from hemodialysis apparatus; and

f. transmitting said purified blood through said cuff into said venous outflow catheter

which is located in the right atrium and the blood is directly deposited into the right

atrium.

18. (previously presented, appealed) The method according to claim 16 wherein said venous outflow catheter has a diameter of about 1 mm smaller than said arterial graft.

19. (original, appealed) The method according to claim 16, wherein said artery is the brachial, axillary, or femoral, external iliac artery.

20. (original, appealed) The method according to claim 16, wherein said the vein is the axillary, jugular, femoral or external iliac vein.

STATUS OF AMENDMENTS

Subsequent to the final rejection and prior to appeal brief, amendments to claims 2, 3, 7, 10, 18, 19 and 20 were made. These were made in compliance with the specifications so that the claims are in proper form.

SUMMARY OF CLAIMED SUBJECT MATTER

An apparatus for positioning a arteriovenous graft and catheter used for subcutaneous access to the vascular system of a patient. The hybrid

arteriovenous shunt is surgically created and comprises a flexible graft and a venous outflow catheter connected to the graft via surgical anastomosis over a cuff. As defined in independent claims 1, 13, 17, the present invention consists of three components: 1. an arterial graft connected to an artery by anastomosis 2. a single lumen venous outflow catheter which is inserted through the vein into the right atrium of the heart and 3. a cuff connecting the arterial graft to the venous outflow catheter. Claim 1 and 13 describe the components of the hemodialysis arteriovenous shunt and claim 17 describes the three components of the arteriovenous shunt and method of operation where the blood is taken from the arterial graft and purified through the machine and is then deposited directly into the right atrium. Refer to page 1 of the specification patent application publication dated September 29, 2005 [0008-0033] and refer to abstract on the cover page and diagrams fig. 1, fig. 2 and fig. 3 of the patent application.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Rejection under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the graded inside diameter of the cuff as set forth in claims 1,13, and 17 must be shown or the feature(s) canceled from the claim. Applicant illustrates and argues that the venous outflow catheter ,12 , is 1mm smaller in diameter than the PTFE graft , 11. However, applicant has not specifically illustrated the graded inside diameter of the cuff to show that it accommodates the varying diameters of the tubes. A "graded" surface indicates a sloping surface, which applicant has not illustrated commensurate in scope with the claims.

2. Claims 1-5,7-10,12-14,17,and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,102,884 to Squitieri in view of US 5,399,173 to Parks et al.

3. Claims 6,11,15,16,19, and 20 are rejected under 35 U. S.C. 103(a) as being unpatentable over US 6,102,884 to Squitieri in view of US 5,399,173 to Parks et al, in further view of US 5,591,226 to Trerotola et al.

4. Claim 10 is rejected under 35 USC 103(a) as being unpatentable over US 6,102,884 to Squitieri in view of US 5,591,226 to Trerotola et al.

ARGUMENTS

BACKGROUND

A conventional arteriovenous shunt is a subcutaneous conduit connecting an artery to the vein so that the blood flows continuously through the shunt at arterial pressure into the thin walled veins which are used to a low pressure flow. The graft is used for hemodialysis purpose in end stage renal failure patients. The blood is taken from the conduit dialyzed and injected back into the venous system. Arteriovenous graft patency rate decreases to 60% in the first year to 20

% in three years. The conduit is made of PTFE graft and 80 % of the failure rate is caused by stenos is at the venous end of the graft. (Morbidity and mortality of dialysis: NIH consensus Statement 1993; 11:1-33) The high flow rate from the shunt into the vein at the point of anastomosis to the vein results in vein wall vibration and injury to the vein wall resulting in neo-intimal hyperplasia which causes narrowing of the vein, thrombus formation and graft malfunction. In 1976, LD Baker Jr. teal were the first to use an expanded polytetrafluoroethylene graft in arteriovenous shunt on 72 patients and it is still in use today (see fig 4).

High failure rate prompted inventors to design arteriovenous access to avoid neo intimal hyperplasia. Squitieri believed neo-intimal hyperplasia is caused at the venous anastomosis and patented a device in 2003 where he positioned the venous outflow catheter within the vein to avoid anastomosis. Trerotola in 1977 invented a stunted graft and positioned the venous end of the graft within the lumen of the vein so as to avoid the anastomosis. The fact remains that anastomosis is not the main factor for neo-intimal hyperplasia. It is the vein wall injury from high flow at arterial pressure, which causes vein wall injury and neo-intimal hyperplasia, thrombosis and graft failure. The applicants of the present art positioned the venous outflow catheter in the right atrium to avoid anastomosis and vein wall injury from the high volume blood flow at arterial pressure and dialyzed blood at high pressure.

Rejection of drawing

1.Rejection under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the graded inside diameter of the cuff as set forth in claims 1,13, and 17 must be shown or the feature(s) canceled from the claim. Applicant illustrates and argues that the venous outflow catheter ,12 , is 1mm smaller in diameter than the PTFE graft , 11. However, applicant has not specifically illustrated the graded inside diameter of the cuff to show that it accommodates the varying diameters of the tubes. A "graded" surface indicates a sloping surface, which applicant has not illustrated commensurate in scope with the claim

Response to Rejection of drawing

In regards to this rejection to the drawings under 37 CFR 1.83(a). The cuff of claim 1, 13 and 17 has a flat surface, which is 1 mm in thickness, wraps around the venous outflow catheter at the inlet end and is surgically anastomosed in an end to end

fashion to the arterial graft. Since the cuff does not cover the arterial graft, it does not have a sloped surface.

1) In figure 1, the venous outflow catheter is number 11 and the arterial graft is number 12. However the examiner has reversed these in the rejection, mislabeling the arterial graft as number 11 and venous outflow catheter as number 12. The examiner has misunderstood that the cuff defines a graded inside diameter. It means that the cuff brings together the arterial graft and venous outflow catheter conduits which are varying diameters. The diameter of arterial graft in the present invention is 1mm more in diameter than the venous outflow catheter and the two are brought together by surgical anastomosis of the venous outflow catheter, cuff, and the arterial graft. This is very clear in the specifications. As the cuff has no graded surface it is submitted that this rejection of claim 1,13 and 17 be withdrawn.

Rejection

Rejection Of claims 1-5, 7-10, 12-14, 17 and 18 under 35 U.S.C. 103(a) as being unpatentable over US 6,102,884 to Squitieri in view of US 5,399,173 to Parks et al.

Response to Rejection

The examiner states that Squitieri's device is substantially similar to the claimed invention of the applicant. In claim 1, Squiteiri discloses an arteriovenous shunt system comprising an arterial graft (53) with a lead end (62) anastomosed to an artery and terminal end connected to needle access site (80), which acts as a connecter that corresponds to applicant's cuff. The system further comprises a venous outflow catheter (65) with an outflow end that is capable of being inserted through a vein (40) into the right atrium of the heart (see figs 6-9) and an inflow end that is connected to connector (80) (see column 4). The access site 80, corresponding to applicant's cuff, directs passage of blood from the arterial catheter to the venous catheter, and is in communication with

the terminal end of the arterial graft and the inlet end of the venous catheter (see figs 6-9,colum 5,lines 19-60).

The claimed invention is different from Squiteiri in the following ways:

1. Squiteiri recognized that the neo-intimal hyperplasia at the anastomotic site accounts for 60 – 80 % shunt failure - see column 6, line 80. He positioned the venous outflow catheter into a large vein to avoid anastomosis of the graft with the vein (Column 6, line 65, Column 3, fig 7 and 8) Claim 16, 8 and 1 – The venous outflow catheter of Squiteiri (65) remains in the **unnamed vein** whereas in our claimed invention, (claim 1,13,17) the venous outflow catheter remains within the right side of the heart, called right atrium. Squitieri's invention was patented because of the position of the venous outflow catheter within the unnamed vein and therefore the length of the catheter in Squitieri's invention is shorter than the claimed invention. Claims 16,8 and 1 in Squitieri's patent puts a limitation on Squitieri's invention with regard to the length of the catheter and his claims make the length of the catheter in Squitieri's invention shorter than our invention because our catheter has to go to the heart. Because of the claim limitation length of the venous outflow catheter in Squitieri's invention, his catheter cannot be advanced beyond the **unnamed vein** to any other position. Therefore any change in the position of Squitieri's venous outflow catheter suggested by the Examiner is incorrect, irrelevant, and will invalidate Squitieri's patent. The examiner cannot suggest a change in the position of the venous outflow catheter that even in the inventor, Squitieri, has never described in his own patent.

   The examiner has to shown any evidence that there is teaching in Squitieri's art for modification. The law requires that there must be some teaching in the prior art for modification. (MPEP 2143.01 in re Kahn, 441 F.3d,977,986,78 USPQ2d 1329,1335 (Fed Cir.2006). The examiner has not given any reason for expected beneficiary results, or some advantage that would come from the modification of Squitieri's art versus claimed invention. The law requires there should be some advantage or expected beneficial results from modification of the prior art. Sernacker, 702 F.2d 989, 994-95,217 USPQ 1,5-6 (Fed Cir 1983). In the absence of teaching or evidence of some advantage or expected beneficial results, one skilled in the art would not be motivated to modify Squitieri's art.

The connector (80) in Squitieri's invention (see fig 9) also has 2 metallic chambers with a silicone membrane that connects the two conduits. In the applicants claimed invention, the cuff is structurally different because it will be made of biocompatible material and will cover the venous outflow catheter

only. The cuff connects the venous outflow catheter to the arterial graft by surgical anastomosis.

The examiner stated that Squiteiri discloses that the arterial and venous catheters may be

connected in various manners by cuffs that may comprise a cylindrical shape (see figs 2, 4, 6, 9,

11, 12, 14 (Squitieri et al) US .

In response to this, Fig 2 in Squitieri's patent, represents a reservoir mounted within a plastic or metal frame (see column 4, line 55) . Fig 4, columns 5, line 15 describes a glued connection between PTFE graft and silicone tubing that is a venous outflow catheter, wherein the PTFE tubing is inserted into the enlarged portion of venous outflow catheter. In our claimed invention, the venous outflow catheter is 1 mm smaller in diameter than the arterial graft and is not inserted into the arterial graft (see fig 1 of the claimed invention). Fig 6. in Squitieri's patent describes an arterial port with needle accessible portions made of silicone. In the claimed invention there is no reservoir and no needle puncture sites in the cuff. In fig 9 (Squiteiri) (see column 6, line 5) there is a dual needle access site (80), two reservoirs which are used for dialysis purpose using two needles. In the claimed invention there are no dual access needles sites on two reservoirs. Fig 11, column 6, page 20 (Squitieri) describes a quick coupler joining the PTFE graft to the port. the needle access site (20) Squitieri is not present in our claimed invention. In the claimed invention there is no needle port and there is no needle access site. Fig 12, line 30 (Squitieri) describes a port with needle access site which is different from the claimed invention. Fig 14 (Squitieri) (column 6, page 55) describes a cuff PTFE graft which is sewn to a vein. In Squitieri's invention, the venous outflow catheter enters through the PTFE graft into the vein and this is different from the claimed invention; our venous outflow catheter does not go through the PTFE. Various types of cuffs described by Squiteiri are structurally different than that of claimed invention.

Rejection by examiner relating to diameter of arterial and venous catheters:

With regard to claims 1, 4 ,5,8,9,12,14 and 18 with respect to diameters of the arterial and venous catheters, Squiteiri discloses that the shunt may be manufactured in a variety of different linear lengths and interior and exterior diameter sizes (see column 3,line 60 to column 4,line 15). It has been held that where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform

differently than the prior art device, the claimed device was not patentably distinct from the prior art device. See MPEP 2144.04(IV)(A). It appears that the device and method disclosed by Squiteiri would perform in the same manner as claimed by the applicant.

Response to rejection by examiner relating to diameter of arterial and venous catheters

Squitieri's invention (column 4, line 10,15), the arterial graft has a length of several centimeters and is 4-7 millimeters in diameter. The arterial end connecting to the artery is 4 millimeters. The venous outflow catheter length and diameter are not mentioned, but as in claim 1(column 8,line 30) the catheter end is positioned within the vein and the diameter is less than the inner diameter of the vein so that the blood flows into the vein and through the vein, around an outer surface of the catheter. In our claimed invention (claim 1) the arterial graft has a specific diameter and the venous outflow catheter has a second specific diameter. The venous outflow catheter is inserted through the vein into the right atrium of the heart. With regard to our invention, Claim 4 speaks of the arterial graft diameter from 2 millimeter to about 8 millimeter and the length is 20-60 cm. Claim 5 also gives the diameter specifications (6-8mm) and the length specifications (40cm). Claim 8 describes the diameter of venous outflow catheter (1-7 mm), and length specifications (20 cm to about 80 cm). Claim 9 describes the diameter of venous outflow catheter (5 mm to about 7 mm), and length specifications (40 – 60 cm). Claim 12 describes that the venous outflow catheters diameter is 1 mm smaller than the arterial graft. Claim 14 also shows that venous outflow catheter has a diameter of about 1 mm smaller than the arterial graft. Claim 18 also states that the venous outflow catheter has a diameter of about 1 mm smaller than the arterial graft.

The difference between claimed invention and Squitieri's invention is that Squitieri only gives the diameter of the arterial graft (4-7mm) (see column 4 line 20) and the applicant's invention provides specific diameters of the arterial graft and venous outflow catheter. The length of the venous outflow catheter in Squitieri's invention is limited and remains shorter than that of the claimed invention, because, in the claimed invention the venous outflow catheter is placed in the right side of the heart (see claim 1,13 and 17 of the claimed invention) so the length is longer than that of Squitieri's invention. The principles of operations are also different. In Squitieri's art the blood flows into the vein (see column 8, claim 1, line 35) whereas in the claimed invention the blood flows into the right atrium of the heart and thus the mode of operation is different than that of the applicant's invention (see also claim 17 of applicants invention, abstract patent application, and Specification page 2, line 0025,line 0033, and page 3, 0056,0058, page 4 claim 1). The mode of operation is quite evident and different from

Squitieri's. It would be obvious to someone having ordinary skill in the art that Squitieri's invention can only deposit blood into the vein.

See MPEP 2144.04(IV)A and Gardener Vs. TEC Systems, INC., 725 F.2d 1338,220 USPQ 777 (fed. Cir. 1984), cert denied, 469 U.S. 830,225 USPQ 232(1984). In this reference the circuit court has clearly stated that when two arts perform differently the claimed invention is patentably distinct from the prior art device. In Squitieri's invention the vein is subject to continuous high blood pressure flow and the high pressure of dialyzed blood hitting the vein wall. Vein wall injury leading to neo intimal hyperplasia and stricture of the vein is bound to occur. As reported in the literature neo intimal hyperplasia is responsible for 80% of graft failure. Therefore the expected success rate will be lower in Squitieri's art than in the claimed invention. In the claimed invention, the shunt will not be clotted or obstructed from neointimal hyperplasia. The life of our shunt will be much longer rate of graft failure will be lower. There are no substantive reasons to reject claims 1,4,5,8,9,12,14, and 18 therefore these rejections should be withdrawn.

Rejection by examiner with regards to Parks et al.

Parks discloses a medical fluid handling apparatus with a ferrule or connector 70 that receives and joins different sized conduits with graded interior wall regions 82, 84, 86 (see fig 7, column 4, lines 55-62). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to add a graded interior surface as disclosed by Parks to the connector between the arterial and venous catheters in the vascular access system disclosed by Squitieri in order to accommodate inserts of various diameters, as taught by Parks.

Response to rejection by examiner with regards to Parks et al.

Parks' invention is a non-analogous art. It belongs to the gastrointestinal system, whereas the claimed invention pertains to the arteriovenous system. Parks ferrule is disposed within the conduit (column 3, line 10, fig 12) Parks ferrule has a graded surface because it joins various conduits. In the claimed invention our cuff has a flat surface. It covers only one conduit namely the venous outflow catheter and is surgically sutured to the arterial graft. Parks invention is used for the creation of a gastrostomy tube, whereas the claimed invention creates an arteriovenous shunt for hemodialysis purposes. Parks' ferrule (cuff) is made from hard non-deformidable material such as plastic, metal, or glass. See page 4, line 25. **If Parks' cuff is used in claimed invention, it has to go within the lumen of the arterial graft and the venous outflow catheter. Park's**

cuff has a ridged inner surface and will act as a foreign body within the lumen of the arterial graft and venous outflow catheter leading to obstruction of the flow of blood, thrombosis and destruction of the function of the claimed invention. Blood will not flow through it in with smooth laminar flow as it would through our cuff. It is this turbulent flow and obstruction to the flow of blood that would cause thrombosis (clotting) and destruction of function of the claimed invention. It would cause the same destructive result to the flow of blood in Squitieri's invention. Combining Squitieri's and Park's references would lead to destruction of the function of such a device , because Park's cuff has to go within the two conduits of Squitieri's art leading to obstruction of the blood flow, clotting of the shunt, and destruction of the function of the shunt and our claimed invention. It would not be obvious to the applicants or someone with ordinary skill in the art to consider Parks' art at the time the claimed invention was made (refer KSR International Co. Vs Teleflex INC., 550 U.S., 82 USPQ2d 1385, 1397 (2007). This reference is irrelevant and the examiner has made a substantial error in citing this reference. One in the ordinary skill in the art will not be motivated and it is not obvious to someone of ordinary skill to combine two references which would lead to the destruction of the function of the claimed invention.

Rejection by examiner with regards to the materials in claims 2, 3, and 7

The examiner states that Squitieri discloses an embodiment, tubing or cuff (69) which is made of PTFE (polytetrafluoroethylene), a biocompatible , flexible material.

Response to rejection by examiner with regards to the materials in claims 2, 3, and 7

In the claimed invention, the arterial graft (claim 2) can be made of a biocompatible material and the word flexible has been removed. Claim 3 is amended. The words polytetrafluoroethylene (PTFE) and 'other' has been removed and replaced with biocompatible material. The AV shunt of claim 2 is made of biocompatible material. Amended claim 7 , states the cuff, is made of polyethylene terephthate or other biocompatible materials (claim 7). These are now amended claims, therefore any rejections with regard to the unamended claims 2, 3 and 7 should be withdrawn.

Rejection by examiner with regard to claim 13

The examiner states that Squitieri also discloses that the arteriovenous graft system which may be connected to a hemodialysis machine (not shown), meeting the limitations of the claim (see column 4 , lines 60-64)

Response to rejection by examiner with regard to claim 13

The goal of both inventions is to perform hemodialysis. Squitieri does not retain the authority over all hemodialysis devices utilizing an arteriovenous graft because his device does that. This does not limit claim 13. The examiner cannot limit claim 13 of the claimed invention, because it performs dialysis which is the goal of Squitieri's art as well. The basis for the rejection is irrational and the rejection should be withdrawn.

With regard to claim 13 of the claimed invention it describes the arteriovenous shunt for performing hemodialysis on patients comprising of arterial graft connected to the artery, single lumen venous outflow catheter deposited into the right atrium and a connecting cuff.

The differences between claimed invention and Squitieri's art have already been described, being both structural and operational. The arteriovenous shunts of Squitieri's and claimed invention are used for hemodialysis purpose and in both of the inventions the dialysis machine is used for dialysis. The goal of the two inventions is to perform dialysis. There is no reason to reject claim 13, because of the operational and structural differences of the two inventions already presented, therefore the rejection of claim 13 should be withdrawn.

The combined reference of Squitieri and Parks do not match the claimed invention. Squitieri taught and suggested that the venous outflow catheter remain within the vein. Parks' art is irrelevant and would lead to the destruction of the operational function of the claimed invention. The combined references do not teach or suggest any modification of the prior art. Therefore it would not be obvious to one with ordinary skill in the art to use the combined references which would lead to the destruction of the functioning of the claimed invention. The applicant's disagree with the examiner's

remarks (see page 2) that claimed invention is unpatentable over Squitieri's and Parks arts.

Rejection to claim 6,11,15,19,20

Claims 6, 11, 15, 16, 19 and 20 are rejected under 35 U.S.C 103(a) as being unpatentable over US 6,102,884 to Squitieri in view of US 5,399, 173 to Parks et al, further in view of US 5, 591,226 to Trerotola et al. In the specification and figures, Squitieri and Parks' disclose the device and method substantially as claimed by applicant (see rejection above) with the exception of the particular arteries and veins that are used to connect to the arteriovenous system. Squitieri is silent as to the particular vessels used, but it is well known in the art of arteriovenous grafts that one may select any given vessel based on the suitability for its purpose. Trerotola discloses a stent-graft that may be deployed between many vessels within a patient, and discloses a graft between a brachial artery and an axillary vein (see fig 9A and accompanying text). Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to connect the arteriovenous graft system disclosed by Squitieri to the brachial artery and axillary vein as disclosed by Trerotola in order to create blood flow between the selected vessels, as demonstrated by Trerotola.

Response to Rejection to claim 6,11,15,19,20

The Examiner agreed that Squitieri does not mention the name of the arteries and the veins in the construction of his arteriovenous shunt. The examiner refers to Trerotola who makes a brachioaxillary shunt with stunted graft as shown in fig 9A. The graft is inserted within the lumen of the axillary vein to avoid anastomosis. Trerotola's art is different from the claimed invention because the claimed invention does not use the graft within the vein but places the venous outflow catheter through the vein into the right atrium. The veins that are used for routing the catheter into the right atrium of the heart are found in claim 11, 16 and 20 and the arteries used in the construction of the hemodialysis apparatus are found in claim 6, 15, 19. In Trerotola's art the arterial blood from the shunt goes into the axillary vein and if this shunt is used for dialysis purposes, the ejected blood at high pressure will go into the axillary vein leading to vein injury, neo intimal hyperplasia and graft failure. There is no reason to reject claim 6, 11, 15, 16, 19, and 20. The names of the particular arteries and the veins, have to be mentioned to construct the arteriovenous shunt. It is obvious to ones with ordinary skill in the art as the applicants are, that the particular vessels have to be named to construct an arteriovenous shunt. In the claimed invention the arteries that are used are mentioned

in claim 11, 15 and 19, and the veins are mentioned in claim 6, 16 and 20. The combined references of Squitieri, Parks and Trerotola would not construct an invention as of our claimed invention and lead to the destruction of the function of Squitieri's and our claimed invention. One skilled in the art would not find obvious or be motivated to combine the three references. There the rejections of claim 6,11,15,19, and 20 should be withdrawn should be withdrawn.

Rejection to claim 10

Rejection of claim 10 under 35 U.S.C. 103(a) as being unpatentable over US 6, 102,884 Squitieri in view of US 5,591, 226 to Trerotola et al.

Response to rejection of claim 10

Claim 10 is amended wherein the venous outflow catheter is made of biocompatible material. Therefore the rejection based on the use of polyurethane in the Trerotola stent graft should be withdrawn and rejection 10 should be withdrawn.

Rejection to claim 17

Rejection of claim 17 under 35 U.S.C. 103(a) as being unpatentable over US 6, 102, 884 to Squitieri in view of US 5, 399, 173 to Parks et al, further in view of US 5, 509,897, Twardowski at al.

With regard to claim 17, the cited prior art discloses the method substantially similar as claimed by applicant (see rejection above). In particular, Squitieri discloses that the graft may be surgically inserted (see column 7,lines 24-45), connected to a hemodialysis machine (which, by definition, purifies blood)

collect blood through the arterial catheter, send the blood through a dialysis machine, and collect blood from the dialysis machine and return it to the patient via the venous catheter (see column 4,lines 50-64). Squitieri fails to disclose that the treated blood is deposited directly into the right atrium, but suggests such an arrangement in the illustrations of figs 7 and 9 which shows venous catheter 65 extending towards the heart via vena cava 40. Blood flows from the vena cava into the right atrium. Nonetheless Twardowski discloses an apparatus and method for hemodialysis which a venous catheter comprises a distal end(138a) disposed within the right atrium delivering treated blood to the right atrium in order to provide a long term indwelling catheter. Therefore it would have been obvious to one having ordinary skill in the art at the time of invention to advance the catheter disclosed by the cited prior art deeper into the patient's vasculature to the right atrium, as disclosed by Twardowski in order to provide a long term indwelling catheter without major drawbacks as taught by Twardowski et al.

Response to rejection of claim 17:

Twardowski's invention is a hemodialysis catheter where the blood remains stagnant within the catheter when not in use for dialysis. The catheter has two lumens (see page 7 of description of the invention and fig 3). The catheter has three parts (See fig 11,) ;part 1 goes through the vein into the right atrium. The second part is tunneled under the skin (140 fig 11) and has two cuffs (154, 156) and the third part exits the skin and remains with two ports outside the skin on the chest wall (See fig 5) . Through port 2, the blood is taken out and passed to the hemodialysis machine and is connected to the first port which returns the blood to the venous side. The catheter tip (138) remains in the right atrium as shown in fig 9. Therefore the multilumen hemodialysis catheter of Twardoski is also called a cuffed tunneled dialysis catheter.

The applicant's art is different from Twardowski art in the following ways:

1.The claimed invention is a sub-cutaneous arteriovenous shunt, where the blood is continuously

flowing through the shunt, at arterial pressures, into the right atrium. In Twardowski's catheter

the blood flows at high pressure

through the catheter at the time of dialysis only therefore it's not a sub-cutaneous arteriovenous shunt.

2. Twardowski's catheter is a double lumen catheter where as claimed inventions venous outflow catheter is a single lumen catheter (See claim 1, 13 and 17).

3. Squitieri's venous outflow catheter is also a single lumen catheter which goes within the lumen of the vein whereas in claimed invention the catheter goes into the right atrium.

4. Combining Squitieri's and Twardowski's devices is physically impossible because Twardowski's catheter is a double lumen catheter and part of the catheter exits outside the skin as two ports. Squitieri's is a single lumen catheter. The combination is physically impossible because a single lumen catheter of Squitieri and double lumen catheter of Twardowski cannot fit together. The sub-cutaneous shunt of Squitieri cannot be constructed because the two ports of Twardowski's hemodialysis catheter are outside the skin on chest wall. Those with ordinary skill in the art would find it impossible to combine Twardowski 's and Squitieri's references.

As described before Parks' reference is non-analogous and has a graded cuff which if used in applicant's art it has to be placed within the lumen of the conduits which will lead to obstruction of blood flow, clotting of the invention and malfunction; thereby destroying the function of the claimed invention. If Parks cuff is used in Squitieri's art it will lead to destruction of his art.

Squitieri taught that the catheter remained within the vein. Therefore these three references are improper and cannot match the claimed invention. Claim 17 of the claimed invention describes the hemodialysis apparatus where the blood is taken from the arterial graft to the dialysis machine and from the machine to the venous outflow catheter which deposits the dialyzed blood into the right atrium. The claimed device is structurally different from Squitieri as described before and the method of operation is different from Squitieri where the blood is deposited into the vein after hemodialysis. Claim 17 is a novel one, because of the positioning of the catheter in the right atrium. It is not possible to make the claimed invention by combining the above three references because that will cause destruction of function of the claimed invention and Squitieri's art, therefore rejection 17 should be withdrawn.

Combining the four references of Squitieri, Parks, Twardowski and Trerotola does not make the claimed invention. The examiner has not shown any evidence of some reason to combine the four references. The test of teaching suggestion and motivation does not exist in the prior four arts. A person of ordinary skill in the art would not combine the four references, as the reference of Park's and Squitieri's will lead to the malfunction and destruction of Squitieri's art and claimed invention and also combining

Twardowski's with Squitieri's art is physically impossible. Furthermore one with ordinary skill in the art will not combine Squitieri's and Twardowski's art because that will not create a subcutaneous arteriovenous shunt as the catheters have different numbers of lumen; Squitieri's art has a single lumen and Twardowski's art has a double lumen and the catheter hangs out of the skin on the chest wall as two ports. Therefore it will be impossible physically to combine Squitieri's art and Twardowski's art. Thus combining the four arts does not make an invention as that of the applicants'.

SECONDARY CONSIDERATIONS

The HeRO ™ Vascular Access Device is used for hemodialysis is structurally and functionally identical to claimed invention. It performs the function in the same way as that of our claimed invention (Doctrine of Equivalent). An FDA approved clinical trial was conducted by Dr. Katzman, H. and Dr. Chris Stout et Al. Dr. Katzman presented the data before the society of cardiovascular surgery in March 2008. The manufacturer of the device is Hemisphere Inc. The clinical trial was conducted to evaluate the HeRO device with respect to bacteremic rate, adequacy of dialysis and patency. The data obtained is applicable to our claimed invention.

When comparing bacteremic (infection) rates, the graft arm HeRO (the HeRO device combined with the arterial graft) had a bacteremic rate of 0.6 at 1000 days. Standard arteriovenous graft infection rates are 0.11 at 1000days. Standard tunneled cuffed dialysis catheters have a bacteremic rate of 2.3 at 1000 days. The infection rate in the HeRO device is lower than in the AV graft and cuffed tunneled dialysis catheter (Table 3, page 5 "HeRO ™ Vascular Access Device: A Long Term Solution for Access-Challenged Patients." Katzman et al Presented at Society for Cardiovascular Surgery March 2008, See Abstract Exhibit 1 of Declaration of Oath).

The overall patency rate, which is the rate functioning of the arteriovenous shunt of the HeRO device, is also higher than cuffed tunneled dialysis catheter (Refer to table 4 of Katzman et al).

The adequacy of the dialysis as measured by (Kt/V), which is an index of clearing of the impurities of the blood, demonstrates that the HeRO device is superior and had a (Kt/V) of 1.7 versus a cuffed tunneled dialysis catheter (1.29-1.46) and the AV graft which is (1.37-1.62). The National Kidney Foundation Dialysis Outcome Quality Initiative-K/D OQI provides a target value for adequacy of dialysis which is 1.4 (higher score correlates to higher clearance of the impurities from the blood). Thus the functioning of the HeRO device is better than the cuffed tunneled dialysis catheter. The study further revealed that the KT/V had an impact on the mortality. A decrease of 0.1 Kt/V is associated with a 7% increase in mortality (more deaths) Refer to table 6, Katzman et al.

It is very clear that the claimed invention will have a better patency rate, reduced infection rate and a reduced mortality as compared to Twardowski's cuffed tunneled dialysis catheter. The decreased mortality is a new and unexpected finding.

Chris Stout presented the clinical study of HeRO device before the Society for Clinical Vascular Surgery in March 2009 with patients of central vein occlusion. The 52 patients underwent the procedure and the HeRO device was successfully placed in 50 patients who had successful dialysis; this is an unexpected finding that the HeRO dialysis catheter can be effective in central venous occlusion in patients with chronic renal failure.

The results of the study show new and unexpected findings that claimed invention will better dialysis and long patency as compared to cuffed tunneled catheter of Twardowski's art. To applicant's knowledge Squitieri's art has not gone into clinical trials and Trerotola invention is an experimental one.

This long felt and unsolved need for avoiding 80% graft failure from neo-intimal hyperplasia can only be solved if the venous outflow catheter is positioned in the right atrium. The vein wall damage will not occur because blood goes directly into the heart and not into the vein.

The study demonstrated superior results of claimed invention, unexpected and new results, and the claimed invention met all four Graham's In (Graham v. John Deere Co.) respect to the scope and content of the prior art, the difference between claimed invention and the prior art and the level of ordinary skill is the pertinent art, secondary considerations, long felt unsolved need and failure of others. The problem of the neo-intimal hyperplasia can be eliminated only with the claimed invention and therefore the long felt unsolved need can be resolved.

Commercial Success

Dr. Katzman is going to present the early commercialization of the HeRO vascular device at the annual convention of the Society of Vascular Surgery in June 2009 in Denver, Colorado.

The claimed invention satisfied four of Graham's factors (35 U.S.C. 103 is stated in Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966).

First the scope and content of prior art is outlined in the background section of the appeal brief. Second, the difference between the prior art and claimed invention is outlined in various sections of the appeal brief. Third, the level of ordinary skill in the art is outlined in multiple sections in the Arguments section of the Appeal Brief. Fourth, secondary considerations have been outlined. In addition, the long felt and unsolved needs in the art have been discussed.

CONCLUSION

In view of the secondary consideration, new and unexpected results; and superior performance of the claimed invention as demonstrated through Dr. Katzman 's and Dr. Stout's studies. Satisfying all four factors of Graham's unobviousness, the primafacie case of obviousness is rebutted . On the basis of the novelty and unobvious features of the claimed inventions, all the rejections 1-20 should be withdrawn and the patentability should be granted.

An appeal brief is submitted in a proper form for the consideration of patentability by the appeals board. If you have any questions please call Nazir Khan at 312-590-0589 or 312-329-1100 or Iftikhar Khan at 312-730-8796.

Thank you.

Iftikhar Khan MD

747 W Wrightwood Ave, Unit C Drive

Chicago, IL 60614. 60527.

Iftikhar Khan

5/23/09

Nazir Khan MD

150- Glenmora

Burr Ridge, IL

Nazir Ahmad Khan

5/23/09

VIII) Claims Appendix. Copies Of The Claims involved in the appeal are attached.

1. (amended, appealed) An arteriovenous shunt comprising:

a. an arterial graft comprising a body, a lead end and a terminal end, said lead end being configured for subcutaneous connection to an artery by anastomosis, wherein said arterial graft has a first diameter; and

b. a single lumen venous outflow catheter comprising an intake end and depositing end, said depositing end being configured for insertion through a vein into the right atrium of the heart, wherein said venous outflow catheter has a second diameter different from said first diameter; and

c. a cylindrical cuff operable to direct passage of blood from said arterial graft to said venous outflow catheter, said cuff comprising an inlet in blood communication with an outlet:

i. said inlet being disposed about and connected to said terminal end of said

arterial graft; and

ii. said outlet being disposed about and connected to said intake end of said

venous outflow catheter; wherein said cuff provides a secure fit for

said arterial graft first diameter and said venous outflow catheter second diameter.

2. (previously presented, appealed) The arteriovenous shunt of claim 1 wherein said arterial graft

is made of a biocompatible flexible material.

3. (amended, appealed) The arteriovenous shunt of claim 2, wherein said biocompatible

flexible material is polytetrafluoroethylene(PTFE) or other biocompatible material

4. (appealed) The arteriovenous shunt of claim 1, wherein said arterial graft has a

diameter from about 2 mm to about 8 mm and a length from about 20 cm to about 60 cm.

5. (appealed) The arteriovenous shunt of claim 4, wherein said arterial graft has a diameter of from about 6 mm to about 8 mm and a length of about 40 cm.

6. (appealed) The arteriovenous shunt of claim 1, wherein said artery is the brachial, axillary, femoral or external iliac artery.

7. (Appealed) The arteriovenous shunt of claim 1, wherein said cuff is polytetrafluoroethylene or polyethylene terephthalate.

8. (Appealed) The arteriovenous shunt of claim 1, wherein said venous outflow catheter has a diameter from about 1 mm to about 7 mm and a length of from about 20 cm to about 80 cm.

9. (Appealed) The arteriovenous shunt of claim 1, wherein said venous outflow catheter has a diameter from about 5 mm to about 7 mm and a length of from about 40 cm to

about 60 cm.

10. (amended, appealed) The arteriovenous shunt of claim 1, wherein said venous outflow catheter is made of other biocompatible materials.

11. (appealed) The arteriovenous shunt of claim 1, wherein said vein is the cephalic, axillary, jugular, femoral or external iliac vein.

12. (previously presented, appealed) The arteriovenous shunt of claim 1, wherein said venous outflow catheter has a diameter of about 1 mm smaller than said arterial graft.

13. (amended, appealed) A system for performing hemodialysis on a patient comprising: a. an arteriovenous shunt comprising:

i. an arterial graft comprising a body, a lead end and a terminal end, said lead end being configured for subcutaneous connection to an artery by anastomosis, wherein said arterial graft has a first diameter; and

ii. a single lumen venous outflow catheter comprising an intake end and

depositing end, said depositing end being configured for insertion through a

vein into the right atrium of the heart, wherein said venous outflow catheter

has a second diameter different from said first diameter; and

iii. a cylindrical cuff operable to direct passage of blood from said arterial graft

to said venous outflow catheter, said cuff comprising an inlet with blood

communication with an outlet:

1. said inlet being disposed about and connected to said terminal end of

said subcutaneous graft; and

2. said outlet being disposed about and connected to said intake end of

said venous outflow catheter; wherein said cuff provides a secure fit for said arterial graft first diameter and said venous outflow catheter second diameter;

14. (previously presented, appealed) The system according to claim 13, wherein said venous outflow catheter has a diameter of about 1 mm smaller than said arterial graft.

15. (original, appealed) The system according to claim 13, wherein said artery is the brachial,

axillary, femoral or external iliac artery.

16. (original, appealed) The system according to claim 13, wherein said vein is the cephalic,

axillary, jugular, femoral or external iliac vein.

17. (amended, appealed) A method of performing hemodialysis on a patient comprising:

a. surgically inserting an arteriovenous shunt into a patient, wherein said arteriovenous

shunt comprises:

i. an arterial graft comprising a body, a lead end and a terminal end, said lead

end being configured for subcutaneous connection to an artery by

anastomosis, wherein said arterial graft has a first diameter; and

ii. a single lumen venous outflow catheter comprising an intake end and

depositing end, said depositing end being configured for insertion through a

vein into the right atrium of the heart, wherein said venous outflow catheter

has a second diameter different from said first diameter; and

iii. a cylindrical cuff operable to direct passage of blood from said arterial graft

to said venous outflow catheter, said cuff comprising an inlet in blood

communication with an outlet:

1. said inlet being disposed about and connected to said terminal end of

said arterial graft; and

2. said outlet being disposed about and connected to said intake end of

said venous outflow catheter, wherein said cuff provides a secure fit for said arterial graft first

diameter and said venous outflow catheter second diameter;

b. connecting said arterial graft to a hemodialysis apparatus;

c. collecting blood from the patient through said arterial graft;

d. passing said blood through the hemodialysis apparatus;

e. collecting purified blood from hemodialysis apparatus; and

f. transmitting said purified blood through said cuff into said venous outflow catheter which is located in the right atrium and the blood is directly deposited into the right atrium.

18. (previously presented, appealed) The method according to claim 16 wherein said venous outflow catheter has a diameter of about 1 mm smaller than said arterial graft.

19. (original, appealed) The method according to claim 16, wherein said artery is the brachial,

axillary, or femoral, external iliac artery.

20. (original, appealed) The method according to claim 16, wherein said the vein is the axillary, jugular, femoral or external iliac vein.

IX) Evidence Appendix: Copy of the declaration of oath with exhibit 1 and 2 are attached.

Declaration in Support of Application

1. We are the applicants in the above identified patent application

2.We declare the HERO™ (Hemodialysis Reliable Outflow) vascular access device, manufactured by Hemisphere Inc. company is a hemodialysis arteriovenous shunt identical to the applicants claimed invention. Clinical studies revealed new and unexpected results.

These results are a marked decrease in bacteremia rate versus currently used cuffed tunneled dialysis catheters and current arteriovenous graft literature.

Improved adequacy of dialysis and patency versus currently used cuffed tunneled dialysis catheters.

Please see Exhibit 1 and Exhibit 2 as supporting documents for the HERO™ device.

In patients with central venous occlusion, the HERO™ device has achieved a success rate for allowing dialysis in patients with no other option, 96.2% of the time (50/52 patients).

3. I declare that all of the statements made herein of my knowledge are true and that all statements made upon information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment , or both, under Section 1001 of Title 18 of United States Code, and that such willful false statements may jeopardize the validity of the application and any patent issuing therefrom.

IX) Evidence Appendix: Copy of the declaration of oath with exhibit 1 and 2 are attached.

X) Related Proceedings Appendix

The copies of the court decisions are attached

Exhibit 1 Appeal Brief for App. No.: 10/812,380 (IX) Evidence Appendix

Kaufman, H. HeRO Vascular Access Device: A New Long-Term Dialysis Access Option for Access-Challenged Patients SCVS March 2008	Objective: The purpose of the study was to assess HeRO bacteremia and patency rates, adequacy of dialysis, and adverse events in graft-eligible and in "access challenged" subjects i.e., catheter dependent /poor-venous outflow subjects. Methods: The HeRO device consists of a 6 mm inner diameter (ID) ePTFE upper arm graft fitted with a titanium connector that is surgically coupled to a subcutaneous 5 mm ID nitinol reinforced silicone outflow catheter designed to bypass peripheral stenosis and exit into the right atrium via the IJ vein. Ninety HeRO subjects were enrolled in two study arms – access challenged (catheter arm) and graft-eligible (graft arm) subjects. Study endpoints included bacteremia and patency rates, adequacy of dialysis and adverse events. All results were compared to literature. Results: The data shows a marked decrease in the HeRO-related bacteremia rate in both study arms. The catheter arm HeRO-related bacteremia rate was 0.12/1,000 days versus IJ tunneled dialysis catheter (TDC) literature rate of 2.3/1,000 days. The graft arm HeRO-related bacteremia rate was 0.06/1,000 days versus graft literature rate of 0.11/1,000 days. HeRO patency rates (primary, primary-assisted, secondary and functional) in both study arms were better than TDC literature and equivalent to graft literature. HeRO adequacy of dialysis data (spKt/V 1.6-1.7) surpasses TDC literature (spKt/V 1.29-1.45) and was comparable to graft literature (spKt/V 1.57-1.67). Serious device/procedure-related adverse events were comparable to both TDC and graft literature. Conclusions: The HeRO device may be the best long-term access alternative for access challenged patients including those that are catheter dependent, are failing fistulae and grafts due to venous obstructions, have poor anatomy for a fistula or graft, or are receiving inadequate dialysis via a TDC.
Work, J. New Vascular Access Device Option for Catheter Dependent Patients ASDIN February 2008	Purpose: The purpose of this study was to evaluate catheter-dependent patients dialyzing with a new long-term access option, the Hemodialysis Reliable Outflow (HeRO™) vascular access device for device/implant procedure-related bacteremias compared to chronic tunneled dialysis catheter literature rates. HeRO is entirely subcutaneous and consists of a 6 mm inner diameter ePTFE upper arm graft connected to a 5 mm inner diameter nitinol-reinforced silicone outflow catheter that empties into the central venous system eliminating the need for graft to vein anastomosis, thus bypassing peripheral venous stenosis. Methods: This was a multi-center FDA regulated study designed on the premise that subjects considered catheter-dependent or poor candidates for fistula or graft due to inadequate venous outflow would experience a significant reduction in bacteremia rates with the HeRO device compared to a tunneled dialysis catheter. Results: The 35 subjects enrolled had on average 4.2 previous TDCs (range 1-10) and 1.7 previous bacteremias (range 1-4). As of 10/26/07, 6,480 HeRO days have accumulated with an average of 7.3 months of HeRO follow-up. The overall HeRO device/procedure-related bacteremia rate was 0.62/1,000 days compared to the catheter literature

Exhibit 2 Appeal Brief for App. No.: 10/812,380 (IX) Evidence Appendix

10:15 am - 11:00 am **SCIENTIFIC SESSION 4 – DIALYSIS**

Moderated by: Joann M. Lohr, MD & Anil Hingorani, MD

Learning Objectives:
- Describe recent trends in outcomes for arteriovenous access procedures
- Recognize evolving strategies to improve treatment planning for arteriovenous access procedures
- Identify novel strategies to enhance outcomes for arteriovenous access procedures in patients with challenging venous anatomy

MP14. Hemoaccess Placement in patients with Challenging Central Vein Occlusion
Chris Stout, MD, Jean Panneton, MD, Marc H. Glickman, MD. Eastern Virginia Medical, Norfolk, VA, USA.

December 12, 2008

Hemoaccess Placement in patients with Challenging Central Vein Occlusion

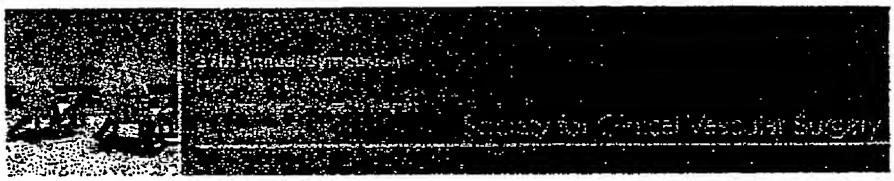
Back to Annual Meeting
Back to Program

Chris Stout, MD, Marc H. Glickman, md, Jean Panneton, MD.
Eastern Virginia Medical, Norfolk, VA, USA.

OBJECTIVES: The placement of hemoaccess devices in patients with central vein occlusion is becoming more challenging for surgeons. The incidence of catheter dependent patients on dialysis continues to rise. Catheter dependent dialysis is fraught with complications including higher morbidity and mortality when compared to conventional dialysis. The purpose of the abstract is to present experience with the HeRO access device, which returns the patient to a conventional graft like access.
METHODS: The HeRO device, a graft with a central outflow component designed to bypass central venous stenosis, consists of ePTFE upper arm graft fitted with a titanium connector that is surgically coupled to a subcutaneous nitinol silicone outflow component which exits into the central venous system. Prospective data included average number of prior access procedures, the degree and type of central vein occlusion, vessel anatomy and surgical implant location.
RESULTS: Fifty two patients have undergone attempted placement of the HeRO devic. Forty patients have had placement of the device after successful angioplasty of near central vein occlusion, four patients have had placement of the device within the subclavian veins with central vein angioplasty, one patient had placement of the device into the SVC through

a retroperitoneal approach for SVC and IVC occlusion, two patients had placement into large azygous veins, four patients had placement through recannalized central veins and internal jugular veins and two patients had unsuccessful placement attempts due to inability to recannalilze the central veins. Fifty patients have had successful placement of this device and of these forty-eight patients have had successful conversion from catheter dependent dialysis to conventional dialysis

CONCLUSIONS: HeRO is the first AV access device to offer significant alternative to patients who are catheter dependent for their dialysis due to central vein pathology. These are very complex and demanding patients. HeRo device offers a promising alternative for these patients allowing conventional dialysis to be achieved



Tuesday, March 17

X). Related Proceedings Appendix

The copies of the court decisions are attached

HeRO™ Vascular Access Device: A Long Term Solution for Access-Challenged Patients.

Howard Katzman MD

Notes

INTRODUCTION

Tunneled dialysis catheters (TDCs) are considered the last resort "long-term" vascular access option compared to arteriovenous fistulas (AVFs) and grafts (AVGs). TDCs cause a high incidence of catheter-related bacteremia because the TDC penetrates the skin barrier creating a route for contamination; TDC-related bacteremias increase patient morbidity and mortality and result in significantly increased hospital costs.[1] TDCs deliver less effective dialysis due to reduced blood flow rates and are plagued with frequent malfunctions. [2-4] Additionally, traditional TDCs may induce central venous stenosis, which can limit future AVF or AVG options.[5] Despite these disadvantages and the success of the Fistula First Initiative, the number of patients dialyzing on TDCs continues to increase. As outlined in the DOPPS studies, the number of prevalent patients dialyzing on catheters virtually doubled from 15.2% in 1996-97 to 28.2% in 2002-2003[6] and as recently as 2006-2007, the End Stage Renal Disease Clinical Performance Measure Project (ESRD CPM project) noted a 2% increase in TDC catheter prevalence. Furthermore, over 70% of ESRD patients initiate dialysis with a catheter.[7]

Tunneled catheter dependency as a result of central venous stenosis, which inhibits peripheral access placement, can be significantly decreased by implantation of the HeRO™ Vascular Access Device. The FDA has cleared the HeRO™ device for maintaining vascular access in those patients who have exhausted all other peripheral access options. This device combines the functional status of an ePTFE graft and tunneled catheter into a permanently implanted subcutaneous access. The HeRO™ device consists of a 6 mm inner diameter (ID) ePTFE graft component fitted with a titanium connector that is surgically coupled at the time of implant to a subcutaneous 5 mm ID braided nitinol reinforced silicone outflow component designed to bypass peripheral stenosis and exit into the superior vena cava/right atrial junction via the internal jugular (IJ) vein, see Figure 1 and Figure 2. The outflow component is introduced into the IJ vein using standard Seldinger technique and tunneled subcutaneously to the delta/pectoral groove in the shoulder area. The HeRO™ ePTFE graft is then tunneled from the shoulder area to the lower portion of the upper arm just above the elbow. The outflow component is then connected to the graft via the silicone encapsulated titanium connector and lastly, a graft to brachial artery anastomosis is created in the same manner as a conventional upper arm ePTFE graft. The HeRO™ device requires a heal-in period to allow the ePTFE to incorporate into the surrounding tissue before it can be accessed. During this time, a patient may require a bridging TDC for dialysis. Once the HeRO™ device is ready for cannulation (per K/DOQI graft cannulation guidelines), it is accessed in the same manner as a conventional graft eliminating the need for special training at dialysis centers.

702 F2d 989 In Re Howard Sernaker

702 F.2d 989

217 U.S.P.Q. 1

In re Howard SERNAKER.

Appeal No. 82-579.
Serial No. 916,018.

United States Court of Appeals,
Federal Circuit.

Feb. 28, 1983.

Michael F. Petock, Philadelphia, Pa., argued and filed briefs for appellant.

Associate Sol. Fred W. Sherling, Washington, D.C., argued for Patent and Trademark Office. With him on th Sol., Joseph F. Nakamura, Washington, D.C.

Before DAVIS, Circuit Judge, COWEN, Senior Circuit Judge, and NICHOLS, Circuit Judge.

NICHOLS, Circuit Judge.

1

This case is before us on appeal from the decision of the Patent and Trademark Office Board of Appeals (bo decision, the board affirmed the examiner's rejection, under 35 U.S.C. Sec. 103, of claims 1-6 and 8-11 in application serial No. 916,018, filed June 15, 1978, entitled "Embroidered Transfer and Method of Making." comprise all the claims in the case. We reverse.

2

* Background

A. The Invention

3

Appellant has invented a type of embroidered emblem and a method of making the same. Claims 1 and 10, independent claims in appellant's application, are representative of the method and of the emblem, respecti

4

1. A method of making an embroidered transfer or emblem comprising the steps of:

5

(a) embroidering a pattern on a portion of a substrate while using thread free from oil and with said thread single color and in an amount so that a portion of the pattern is sculptured by having a greater thickness th portion of the pattern,

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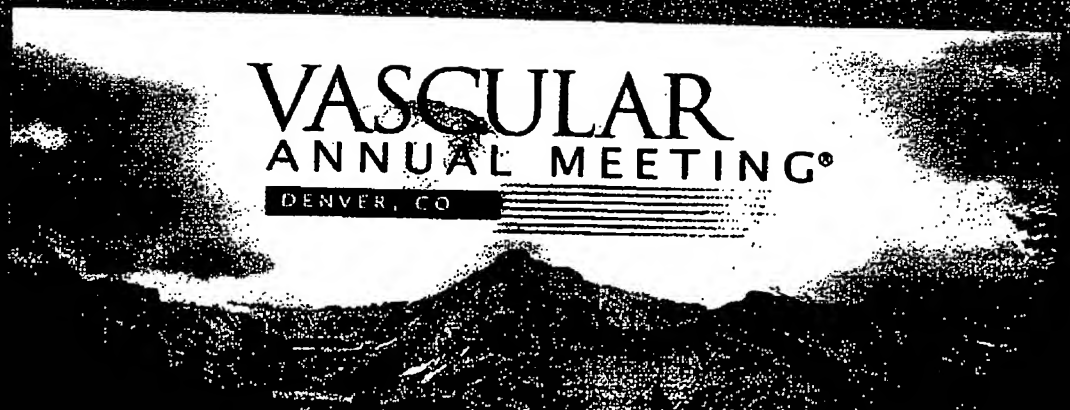

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Mosby

Author Disclosures: J. Vos, None; G.J. De Borst, None; T.T.C. Overtoom, None; J.P.M. de Vries, None; E.D.W. van de Pavoordt, None; P. Zanen, None; R.G.A. Ackerstaff, None.

Dialysis Access, Education/ Training Credentialing

PP20.

Early Commercialization Experience with New Long Term Vascular Access for Catheter-Dependent Patients

Howard B Katzman. University of Miami Hospital, Miami, FL

Objectives: The purpose of this abstract is to report early commercialization experience with the HeRO™ Vascular Access Device, a new long-term dialysis access device approved by FDA for "access challenged" patients i.e., catheter-dependent or patients that are poor candidates for fistulas or grafts due to venous obstruction. The HeRO™ device is designed to provide a graft-like vascular access and lower bacteremia rates than a tunneled dialysis catheter.

Methods: The HeRO™ device, a graft with central outflow designed to bypass peripheral stenosis, consists of an ePTFE upper arm graft fitted with a titanium connector that is surgically coupled to a subcutaneous nitinol reinforced silicone outflow catheter which exits into the right atrium via the internal jugular vein. Procedural data has been captured on 60 early commercialization patients implanted with the HeRO™ device including access and medical history and device-implant success.

Results: To-date, data has been captured on 60 patients (mean age 58.9; 43.3% male; 55.0% diabetic) with a history of 4.1 years on dialysis, a mean 5.0 previous catheters, 2.2 previous grafts, and 1.5 previous fistulas and 3.6 mean previous bacteremias (range 1-17). The HeRO™ device was successfully implanted in all subjects using a variety of interventional techniques, although 60.0% percent had evidence of hemodynamically significant central venous stenosis.

Conclusions: This data demonstrates that access-challenged patients with challenging anatomy and central venous stenosis may be eligible for an alternative long-term vascular access device offering lower bacteremia rates compared to a tunneled dialysis catheter.

Author Disclosures: H.B. Katzman, Participating in HeRO commercialization registry on behalf of Hemosphere, Inc and receiving nominal research grant to complete case report forms as investigator in registry.

PP21.

Reduction and Reconstruction of Aneurysmal Arteriovenous Fistulas: Mid-Term Results of a Novel Approach to Salvage Autogenous Dialysis Access

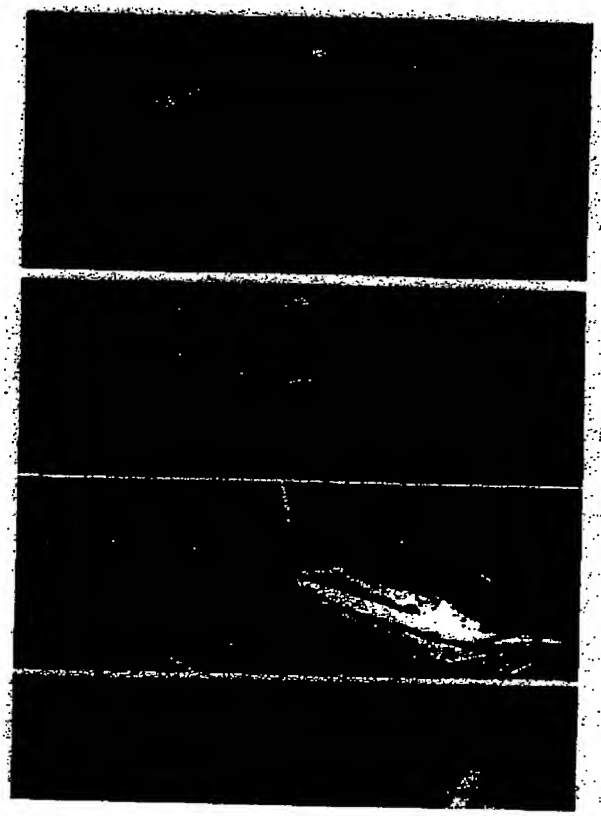
Karen Woo[1], Patrick R Cook[1], Robert J Hye[2], Timothy G Canty[2]. [1]Scripps Green Hospital, La Jolla, CA; [2]Kaiser Permanente Medical Group, San Diego, CA

Background: Over the last decade, K-DOQI guidelines have increasingly emphasized the importance of autogenous arteriovenous fistulas (AVF) for dialysis access. A complication of AVF is aneurysmal dilatation with a subset developing massive diffuse aneurysm. Treatment of massive aneurysmal AVF generally involves either ligation or resection with use of prosthetic interposition. In order to maintain an all-autogenous access, we developed a procedure to treat massive aneurysmal AVF in which the lumenal diameter is reduced, excess length is resected, and the new reconstructed AVF is retunneled for continued use.

Methods: Over a 4-year period, the reduction/revision procedure was performed on 18 patients with an AVF diameter of 4-7cm. Indications for operation were thrombosis, skin breakdown, infection, bleeding, and/or poor flow. Revision was performed by resecting redundant length, reducing diameter, and then reconstructing the fistula.

Results: Patients ranged in age from 25 to 83 with a mean of 48. There were 12 men and 6 women. The mean and median follow-up was 20 months. The mean and median primary patency was 17 and 14 months, respectively. The mean and median secondary patency was 19 and 16.5 months, respectively. Two patients died, one AVF thrombosed, and two were ligated secondary to infection. One fistula developed a stenosis that was treated with angioplasty. There are no recurrent aneurysms to date.

Conclusions: Surgical resection of excess length, reduction of lumenal diameter, and reconstruction is a viable option for the treatment of complicated massive diffusely aneurysmal AVF. This technique offers the ability to maintain the benefits of an all autogenous dialysis access while conserving future dialysis sites.



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PP22.

Report of the First Vascular Surgery In-Training Examination (VSITE)

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Background: As Vascular surgery training has evolved from a single clinical year following general surgery training to a multi year training program with independent certification, the need for an in-training examination to assess the preparedness of the candidate for the certification process has become apparent. Our objective is to analyze the psychometric characteristics of the first Vascular Surgery In-Training Examination (VSITE) and to correlate performance on the VSITE with performance on the Qualifying Examination (QE) in Vascular Surgery.

Methods: The Vascular Surgery Board (VSB) in conjunction with the Association of Program Directors in Vascular Surgery (APDVS) appointed a panel to develop the VSITE which was administered by the Vascular Surgery Board of the American Board of Surgery(VSB/ABS). Thirty-one APDVS and SVS members contributed questions in clinical and basic science areas of vascular surgery training. All questions were again reviewed by the panel and the VSB /ABS prior to administration of the examination. The psychometric characteristics of the examination and correlation of performance on VSITE and VQE were undertaken by ABS staff.

Results: On February 16, 2008, 240 examinees took the initial Vascular Surgery In-Training Examination online through a secure, proctored website. This total included 216 vascular residents from 91 of 95 (96%) training programs. The psychometric properties of the examination were excellent with index values comparable to other ABS examinations. The average difficulty value for all items was 76.6%, the average discrimination value was 0.20, the total test reliability coefficient was 0.85 and the standard error of measurement was 2.9% correct. Scores ranged from 55% to 93% correct with an average of 76.7% correct. Sixty-four candidates took both the VSITE and the VQE in 2008. A high correlation of 0.70 was noted between

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EXPANDED POLYTETRAFLUOROETHYLENE (PTFE) SUBCUTANEOUS ARTERIOVENOUS CONDUIT: AN IMPROVED VASCULAR ACCESS FOR CHRONIC HEMODIALYSIS

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Recent experience with expanded polytetrafluoroethylene (PTFE) has demonstrated that a specific form of this material functions extremely well as a small artery prosthesis[1]. The basic ultrastructure of expanded PTFE is illustrated in Figure 1. Spindle-shaped PTFE nodes are oriented radially in the graft wall and these nodes are interconnected by fine fibrils. This node-fibril arrangement forms a type of lattice-work, and the distance between the nodes as well as the node diameter can be varied in the fabrication process. The specific form of this material which gave the most favorable results in regards to controlled tissue ingrowth and long-term patency has the following characteristics: 1) an internodal distance of 20 to 30 μ, 2) a node diameter of less than 12 μ, 3) a wall thickness of between 0.3 and 0.5 mm, and 4) a density of 0.3 Gm/ml. Histological evaluation of these grafts revealed a thin neointima with flattened nucleated endothelial cells facing the bloodstream, along with complete and uniform transmural fibrous tissue ingrowth and intramural neocapillaries.

With the early clinical success of expanded PTFE as a femoral-popliteal artery bypass graft[2], we then considered the use of this material as a subcutaneous A-V conduit for chronic hemodialysis.

Prior to any clinical trial, however, several questions needed to be answered:

1) Could the material withstand repeated percutaneous large bore punctures?

2) Following withdrawal of the dialysis catheter would there be a reasonable and prompt cessation of bleeding?

3) Would clot propogation at the puncture site lead to obstruction of the graft?

4) Would infection of the prosthetic material become a prohibitive problem?

MATERIALS AND METHODS

Experimental. Seven grafts of expanded PTFE* were then inserted into dogs as loop fistulae between the common femoral artery and common femoral vein. Over the following 8 wks, mock dialyses were performed weekly for 4 hrs in each of these dogs with a #14 gauge Medicut catheter. These catheters were inserted percutaneously into the graft, and blood was returned to the animal through a vena puncture in the cephalic vein of the foreleg. The animals were sacrificed after the 8 wk period and the grafts examined grossly and histologically.

Clinical. From April of 1975 through February 1976, 72 patients at the Good Samaritan Hospital Kidney Center and Maricopa County General Hospital Dialysis Unit, Phoenix, Arizona, have been dialyzed using the expanded PTFE subcutaneous A-V conduit (Table I). Forty-three of these patients are male and 29 female. The ages of these patients range from 19 to 73 yrs, with a mean age of 46 yrs. Our preferred method of placement has been what we term the straight forearm graft, which is an anastomosis of the graft to the distal radial artery and to the cephalic vein near the antecubital fossa. If, however, the radial artery is not satisfactory either due to insufficient flow or prior access use, a loop fistula is constructed in the forearm between the brachial artery and cephalic vein. If access sites are not available in the upper extremities, then we have implanted these grafts in the thigh, either as a straight graft between the superficial femoral artery and common femoral vein, or as a loop fistula between the common femoral artery and common femoral vein.

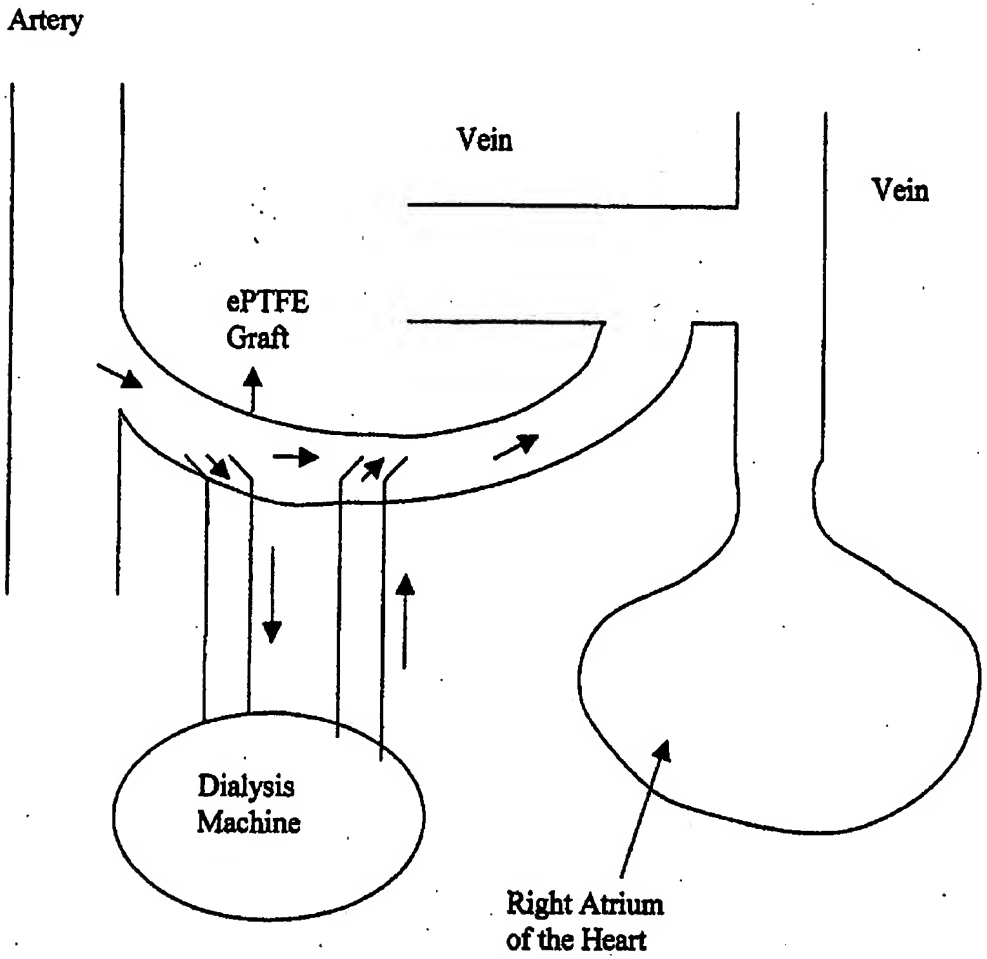
TABLE I

EXPERIENCE WITH PTFE A-V FISTULAS

No. of Patients	72
Male	43
Female	29
No. of Grafts	84
Forearm, straight	48
Forearm, loop	16
Thigh, straight	6
Thigh, loop	13
Arm, straight	1
Age Distribution (yrs)	
10-19	1
20-29	11
30-39	13
40-49	13
50-59	19
60-69	11
70-79	4

We have placed a total of 84 grafts in these 72 patients with 48 in the straight forearm position, 16 as forearm loops, 6 as straight thigh grafts, 13 as thigh loops, and one as a straight arm graft, from the brachial artery at the antecubital fossa to the cephalic vein in the delto-pectoral groove. The majority of these grafts have been 8 mm in diameter, with 10 being 6 mm in diameter. Most of these grafts have been used within 3 days of implantation and several have been employed within 3 hrs. The period of observation has ranged from 4 to 60 wks.

From the Arizona State University-St. Joseph's Hospital Biomedical Engineering Research and Education Program, and Good Samaritan Hospital, Phoenix, Arizona.
Supported in part by The Robert and Irene Flinn Foundation.
*Impra graft, International Medical Prosthetic Research Associates, Inc., 4209 South 36th Place, Phoenix, Arizona.



BITTNER ARTERIOVENOUS SHUNT – (1976)
Subcutaneous with ePTFE conduit

FIG. 4

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2144.04 Legal Precedent as Source of Supporting Rationale [R-1] - 2100 Patentability

2144.04 Legal Precedent as Source of Supporting Rationale [R-1]

As discussed in MPEP § 2144, if the facts in a prior legal decision are sufficiently similar to those in an application under examination, the examiner may use the rationale used by the court. Examples directed to various common practices which the court has held normally require only ordinary skill in the art and hence are considered routine expedients are discussed below. If the applicant has demonstrated the criticality of a specific limitation, it would not be appropriate to rely solely on case law as the rationale to support an obviousness rejection.

I. AESTHETIC DESIGN CHANGES

In re Seid, 161 F.2d 229, 73 USPQ 431 (CCPA 1947) (Claim was directed to an advertising display device comprising a bottle and a hollow member in the shape of a human figure from the waist up which was adapted to fit over and cover the neck of the bottle, wherein the hollow member and the bottle together give the impression of a human body. Appellant argued that certain limitations in the upper part of the body, including the arrangement of the arms, were not taught by the prior art. The court found that matters relating to ornamentation only which have no mechanical function cannot be relied upon to patentably distinguish the claimed invention from the prior art.). But see *In re Dembiczak*, 175 F.3d 994, 50 USPQ2d 1614 (Fed. Cir. 1999) (The claims of a utility application, drawn to a generally round, orange plastic trash bag with a jack-o-lantern face, were rejected under 35 U.S.C. 103. However, the court reversed the rejection for lack of motivation to combine conventional trash bags with a reference showing a jack-o-lantern face on an orange paper bag stuffed with newspapers.); *Ex parte Hilton*, 148 USPQ 356 (Bd. App. 1965) (Claims were directed to fried potato chips with a specified moisture and fat content, whereas the prior art was directed to french fries having a higher moisture content. While recognizing that in some cases the particular shape of a product is of no patentable significance, the Board held in this case the shape (chips) is important because it results in a product which is distinct from the reference product (french fries).).

II. ELIMINATION OF A STEP OR AN ELEMENT AND ITS FUNCTION

A. Omission of an Element and Its Function Is Obvious If the Function of the Element Is Not Desired